

# ELECTRICAL ENGINEERING (MENG)

## Master of Engineering in Electrical Engineering

Unit: Speed School of Engineering (<https://engineering.louisville.edu/>)  
(SP)

Department: Electrical and Computer Engineering (<https://engineering.louisville.edu/academics/departments/electrical/>)

Academic Plan Code(s): EE\_ \_MEN

## Program Information

### General Information

The Bachelor of Science in Electrical Engineering degree will provide a student with the basis to be able to complete the Master of Engineering (MEng) in Electrical Engineering degree. The Master of Engineering in Electrical Engineering degree program is accredited by the Engineering Accreditation Commission (EAC) of ABET (<https://www.abet.org>), under the Commission's General Criteria and the Program Criteria for Electrical, Computer, Communications, Telecommunication(s), and Similarly Named Engineering Programs.

Since the Electrical Engineering MEng is accredited as part of a five-year program with one-year of co-op experience, it is only available for students who have matriculated through the Electrical Engineering bachelor's degree program at Speed School. Therefore, students who earn an undergraduate degree at a school or university other than the University of Louisville pursue the MS degree instead of the MEng degree.

### Master of Engineering Program Educational Objectives

Graduates of the Master of Engineering program in the Electrical and Computer Engineering Department are expected within a few years of graduation to have:

1. Established themselves in successful and productive careers or advanced studies in electrical engineering or a related area, possess technical competency in electrical engineering, and are effective team members and effective communicators.
2. Demonstrated the ability to engage in lifelong learning in electrical engineering and related fields.
3. Acquired a sense of professionalism, with emphasis on professional ethics, an awareness of professional licensing, and participation in the affairs of the profession.

### Master of Engineering Student Outcomes

In order to achieve these objectives, the Master of Engineering program in the Electrical and Computer Engineering Department has the following outcomes set for its graduates. Graduates will demonstrate:

1. An ability to communicate effectively with a range of audiences.
2. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

### Residency

All graduate students are expected to make steady and satisfactory progress toward the completion of degrees. A candidate for the Master of Engineering degree who does not register for credit hours must maintain active registration by paying a fee each semester for MEng residency until the degree is awarded (i.e., the candidate must maintain continuous registration, including summer terms, in Graduate Studies). Failure to

pay the MEng residency fee will be cause to cancel a student's residency. Students who are not enrolled for a period of more than 12 months will be considered to have withdrawn from the program. In order to be restored to residency, the student must submit a new application, have the recommendation of the department chair, receive the approval of the Associate Dean and pay the fee for each of the semesters during which the residency was void.

### Academic Performance

The J.B. Speed School of Engineering has established the following performance policies:

1. The minimum grade point average requirement for good standing is 3.00 for all academic work completed while in graduate studies.
2. Any student with a cumulative graduate GPA below 3.00 will be placed on academic warning. Students on academic warning are limited to enrollment for thirteen (13) credit hours in a fall or spring semester and seven (7) credit hours for summer terms.

Students who do not bring their cumulative graduate GPA back at or above a 3.00 in the semester immediately following Academic Warning, will be placed on Academic Probation for the next semester of enrollment. Students on probation are limited to enrollment for thirteen (13) credit hours in a fall or spring semester and seven (7) credit hours for summer terms. Any student who remains in academic probation for more than a single semester may be considered for dismissal from the program.

3. Students receiving graduate assistantships (teaching, research or service) shall be provided adequate training and shall be required to understand and adhere to University policies related to these areas. The performance of teaching, research and service duties by such students shall be periodically evaluated. Students with teaching assistantships shall be evaluated annually.
4. Students who fail to meet performance goals or who do not meet other requirements as outlined in the admission letter, program requirements or the university catalog may be subject to academic dismissal from their programs.
5. A maximum of eight (8) credit hours of graduate level courses taken as an undergraduate may be used to satisfy MEng degree requirements; these courses cannot have been used to also satisfy BS degree requirements.

### Degree Requirements

The following degree requirements are mandatory of all Master of Engineering candidates:

1. The program of study must be completed with a 3.00 GPA or better for all graduate courses used to satisfy degree requirements. Additionally, the program of study must be completed with a 3.00 GPA or better for all academic work attempted in graduate studies.
2. Master's degree students must take at least 24 credit hours of coursework at the University of Louisville to satisfy the residency requirement for the master's degree. A maximum of six (6) credit hours of graduate credit may be transferred from accredited institutions.
3. Students following the thesis option must follow the Procedures and Standards for Master of Engineering Theses.
4. The total requirements must be completed within six years after admission into graduate studies. The time limit imposed by the rule may be extended in individual cases upon recommendation of the

department chair and approval of the associate dean for academic and student affairs.

5. The MEng degree cannot be conferred prior to the BS degree.

## Admission Standards

Since the Electrical Engineering MEng is accredited as part of a five-year program with one-year of co-op experience, it is only available for students who have matriculated through the Electrical Engineering bachelor degree program at Speed School.

The application form is available online (<http://louisville.edu/speed/academics/forms/MEngGraduateStudiesApplication/>).

The requirements for admission or readmission to a Master of Engineering program are:

1. Submission of a completed MEng application for the field of specialization in which the student is earning a bachelor degree from the J.B. Speed School of Engineering. Students can apply to the MEng program with fewer than thirteen (13) credit hours of BS degree requirements remaining and no later than two years post conferral of their baccalaureate degree. A student's admission into the MEng program is contingent upon successful completion of their undergraduate degree;

2. Recommendation by the faculty and chair of the student's department for admission or readmission to graduate studies;

3. Cumulative baccalaureate grade point average of 2.75. However, those students with cumulative baccalaureate grade-point averages from 2.50 to 2.75 may be admitted upon petition and approval of the chair and faculty of the department.

A student becomes a candidate for the Master of Engineering degree upon admission to graduate studies and initial registration as a graduate student.

## Program Requirements

The Master of Engineering in Electrical Engineering degree requires the following over and above the Bachelor of Science in Electrical Engineering Degree.

Code	Title	Hours
<b>Master of Engineering Coursework</b>		
ECE 695	Graduate Research Seminar in Electrical and Computer Engineering	3
Focus Area (Required Course + 1 Elective Course from approved list) <sup>1</sup>		6-8
ECE Electives <sup>1</sup>		9
Technical Electives <sup>1,2</sup>		6
Select one of the following:		6
<i>Thesis/Paper Option:</i>		
ECE 697	Master of Engineering Thesis or Paper in Electrical Engineering	
<i>Non-Thesis/Paper Option:</i>		
ECE Electives <sup>1</sup>		
<b>Minimum Total Hours</b>		<b>30-32</b>

The Master of Engineering degree must be completed with a 3.00 GPA or better for all graduate courses used to satisfy degree requirements.

Additionally, the Master of Engineering degree must be completed with a 3.00 GPA or better for all academic work attempted in graduate studies.

A maximum of eight (8) credit hours of graduate level courses taken as an undergraduate may be used to satisfy MEng degree requirements; these courses cannot have been used to also satisfy BS degree requirements.

- <sup>1</sup> Focus Area courses and electives must be chosen so that at least one-half of the credits counted toward the degree, exclusive of thesis or paper, are 600-level.
- <sup>2</sup> Technical electives can be ECE or non-ECE courses. Technical electives must be approved by the department.
- <sup>3</sup> ECE 697 Master of Engineering Thesis or Paper in Electrical Engineering is an elective for a total of six (6) credit hours. For the thesis/paper option, a student is urged to select both an approved M.Eng. thesis/paper topic and the director and members of the thesis/paper committee during the first term of graduate studies. The thesis/paper director must give approval for enrollment in ECE 697.

## Focus Areas

### Power and Energy Systems

Code	Title	Hours
Required Course		
ECE 582	Power System Analysis	3
Elective Courses (Select one)		
ECE 531	Power Electronics	3
ECE 569	Intermediate Electromagnetic Fields and Waves	3
ECE 581	Electric Machines and Drives	3
ECE 682	Advanced Power System Analysis	3

### Microelectronics and Nanotechnology

Code	Title	Hours
Required Course		
ECE 542	Semiconductor Device Fundamentals	3
Elective Courses (Select one)		
ECE 510 & ECE 511	Computer Design Computer Design Laboratory	4
ECE 515 & ECE 514	Introduction to VLSI Systems Introduction to VLSI Systems Laboratory	4
ECE 516	Microcomputer Design	4
ECE 533 & ECE 534	Analog Integrated Circuit Design Analog Integrated Circuit Design Laboratory	4
ECE 543 & ECE 544	Fundamentals of Microfabrication Microfabrication Laboratory	4
ECE 547	Semiconductor Photonic Devices	3
ECE 548	Electron Microscopy	3
ECE 549	Micro Electro Mechanical Systems (MEMS)	3
ECE 569	Intermediate Electromagnetic Fields and Waves	3
ECE 611	Computer Architecture	3
ECE 632	Semiconductor Principles	3
ECE 633	Microelectronics Design and Fabrication	4

ECE 636	MEMS Design and Fabrication	4
ECE 638	The MOSFET	3

**Communications and Signal Processing**

Code	Title	Hours
Required Course		
ECE 520 & ECE 521	Digital Signal Processing Digital Signal Processing Laboratory	4
Elective Courses (Select one)		
ECE 518	Fundamentals of Computer Communications and Networks	3
ECE 545	Optical Signal Processing	3
ECE 550 & ECE 551	Communication and Modulation Communication Systems Laboratory	4
ECE 555 & ECE 556	Digital Image Processing Digital Image Processing Laboratory	4
ECE 613	Computational Intelligence Methods for Data Analysis	3
ECE 651	Communication System Design	3
ECE 652	Information Theory and Coding	3
ECE 653	Digital Communications	3
ECE 654	Advanced Voice/Data Networks	3
ECE 656	Wireless Communications and Mobile Radio Networks	3

**Controls, Robotics, and Automation**

Code	Title	Hours
Required Course		
ECE 560 & ECE 561	Control Systems Principles Control Systems Laboratory	4
Elective Courses (Select one)		
ECE 526	LabVIEW for Electrical Engineers	3
ECE 564 & ECE 565	Fundamentals of Autonomous Robots Fundamentals of Autonomous Robots Lab	4
ECE 660	Introduction to Robust Control	3
ECE 661	Sampled-Data Control Systems	3
ECE 662	Introduction to Optimum Control	3
ECE 664	Modern Adaptive Control	3
ECE 665	Theory of Nonlinear Systems	3
ECE 668	Advanced Robotic Manipulation	3
ECE 669	System Identification and Estimation	3

**Artificial Intelligence and Imaging**

Code	Title	Hours
Required Course		
ECE 528 & ECE 529	Deep Learning and AI Tools Deep Learning and AI Tools Laboratory	4
Elective Courses (Select one)		
ECE 520 & ECE 521	Digital Signal Processing Digital Signal Processing Laboratory	4
ECE 523	Introduction to Biometrics	3
ECE 530	Introduction to Random Processes and Estimation Theory	3
ECE 546	Introduction to Medical Imaging	3

ECE 555 & ECE 556	Digital Image Processing Digital Image Processing Laboratory	4
ECE 613	Computational Intelligence Methods for Data Analysis	3
ECE 618	Artificial Intelligence Systems	3
ECE 619 & ECE 645	Computer Vision Computer Vision Laboratory	4
ECE 620 & ECE 655	Pattern Recognition and Machine Intelligence Pattern Recognition and Machine Intelligence Laboratory	4
ECE 640	Introduction to Biomedical Engineering	3
ECE 641	Medical Imaging Systems	3
ECE 643	Introduction to Biomedical Computing	3

**ECE Electives**

Code	Title	Hours
ECE 500	Special Topics in Electrical Engineering	3
ECE 518	Fundamentals of Computer Communications and Networks	3
ECE 523	Introduction to Biometrics	3
ECE 526	LabVIEW for Electrical Engineers	3
ECE 530	Introduction to Random Processes and Estimation Theory	3
ECE 531	Power Electronics	3
ECE 542	Semiconductor Device Fundamentals	3
ECE 543	Fundamentals of Microfabrication	3
ECE 545	Optical Signal Processing	3
ECE 569	Intermediate Electromagnetic Fields and Waves	3
ECE 581	Electric Machines and Drives	3
ECE 582	Power System Analysis	3
ECE 593	Independent Study in Electrical Engineering	3
ECE 600	Special Topics in Electrical & Computer Engineering	3
ECE 611	Computer Architecture	3
ECE 613	Computational Intelligence Methods for Data Analysis	3
ECE 614	Deep Learning	3
ECE 632	Semiconductor Principles	3
ECE 638	The MOSFET	3
ECE 640	Introduction to Biomedical Engineering	3
ECE 641	Medical Imaging Systems	3
ECE 643	Introduction to Biomedical Computing	3
ECE 651	Communication System Design	3
ECE 652	Information Theory and Coding	3
ECE 653	Digital Communications	3
ECE 654	Advanced Voice/Data Networks	3
ECE 660	Introduction to Robust Control	3
ECE 661	Sampled-Data Control Systems	3
ECE 662	Introduction to Optimum Control	3
ECE 664	Modern Adaptive Control	3
ECE 665	Theory of Nonlinear Systems	3
ECE 682	Advanced Power System Analysis	3